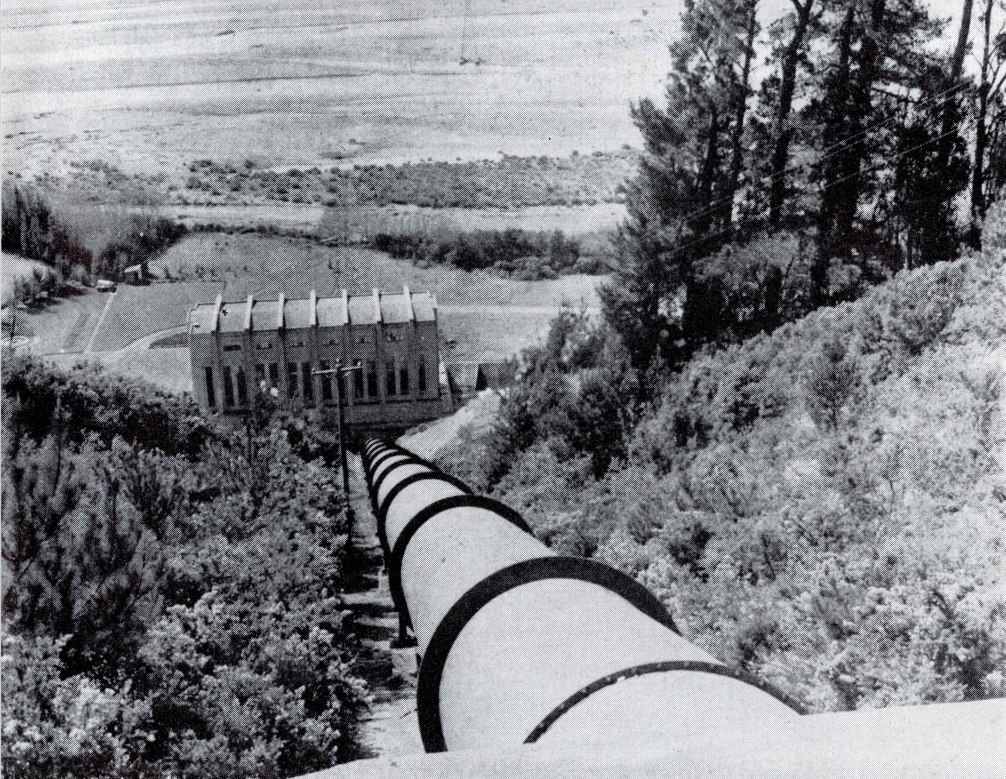


HIGHBANK POWER STATION



HIGHBANK

Highbank power station, which has a capacity of 25,200 kilowatts from one machine, is the second station to be built on the Rakaia River, although the river itself does not supply either with water. The first power station, Lake Coleridge, which has been in operation since 1914, draws its water from the lake augmented by the diversion of the Harper and Acheron Rivers. Highbank power station is situated on the south branch of the Rakaia River, $7\frac{1}{2}$ miles from Methven, and was designed in conjunction with the Ashburton County Irrigation Scheme. Water for the power station is conveyed from the Rangitata River intake through an irrigation race which extends 41 miles to the Rakaia River. The race is noteworthy for the inverted siphons by which the water is taken under the intervening branches of the Ashburton River and other streams.

The combined scheme was planned so that in the summer water taken by control gates placed at convenient intervals in the race could be used for the irrigation of the mixed farming area between the two rivers, and in winter, when irrigation is not essential and the demand for power is high, the head of water available from the Rangitata River could be used to generate electricity. In practice, however, it was found that all water available in the race during the summer is not required for irrigation, making it possible to run the station extensively in both winter and summer, apart from closing down for necessary maintenance and repairs.

The scheme was undertaken by the Government during the period of rapidly increasing demand for power prior to World War II. Work on the

foundations for the powerhouse began in 1939, but owing to the war and the resultant manufacturing delays and shortages of manpower and materials, construction was held up considerably and the station was not completed until 1945.

By 1940 contracts for the machines had been placed, preliminary engineering plans made, and an access road to the site constructed. The powerhouse structure was completed in 1942 and installation of the powerhouse equipment and erection of the 66,000-volt outdoor structure was commenced. An unfortunate event was the sinking by enemy action of the ship which was carrying to New Zealand the stator for the generator at Highbank. This necessitated the manufacture of a new stator in England.

In September 1944 the irrigation race was completed and the first water from the Rangitata reached the Highbank end of the race. It was discovered that there was some seepage through to the back fill at the head-gate structure, which necessitated the building of a second wall at the structure and the laying of drains to carry away any surplus water.

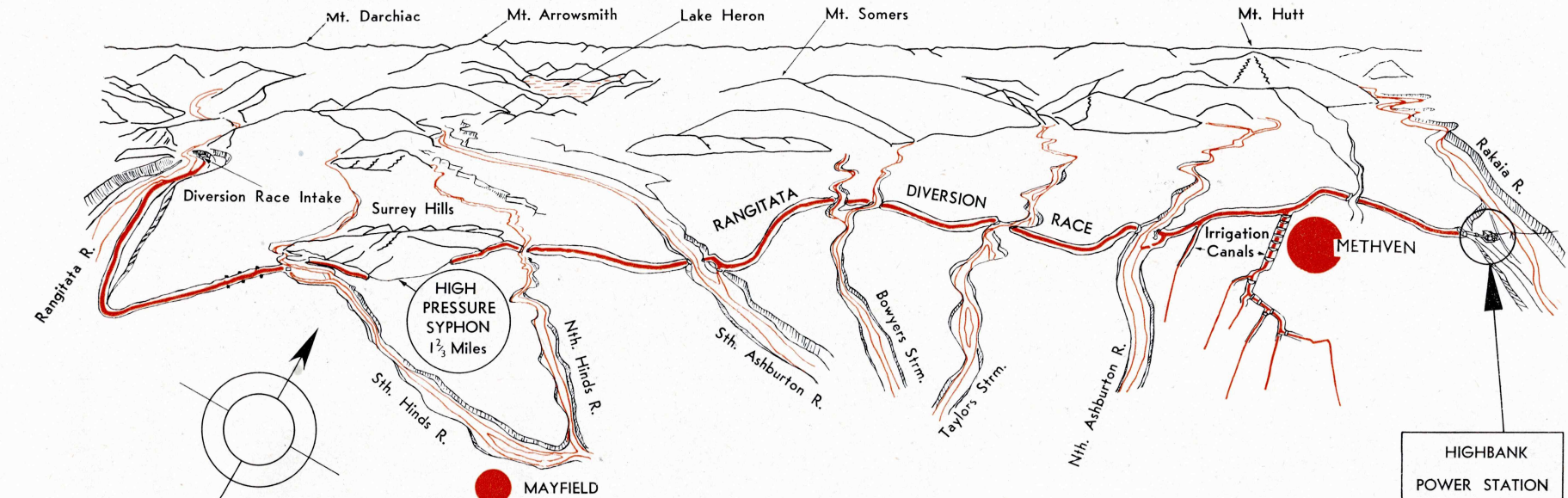
The station was officially opened on 16 June 1945, construction having been held up earlier in the year due to floods which had caused major slips on the approach road and had wrecked cottages and gardens. The village had to be relocated on a level area about a quarter of a mile upstream from the powerhouse, and a new approach road made.

The powerhouse, which is noteworthy for its pleasing modern architecture, is a reinforced-concrete building 120 ft. long and approximately 52 ft. high and 52 ft. wide. A 90-ton crane serves to lift the heavy machinery when required and there is an auxiliary hoist of 10-ton capacity. The one large vertical-shaft generator is driven by a 36,000 b.h.p. Francis turbine at 300 r.p.m. Both turbine and generator were manufactured by the English Electric Co. Ltd. The powerhouse also contains a small auxiliary unit consisting of a 300 b.h.p. horizontal Pelton water turbine driving a 400-volt generator of 80-kilowatt capacity, and a standby excitation set. An interesting fact about the station is that it can be started and stopped automatically by the operation of appropriate push buttons.

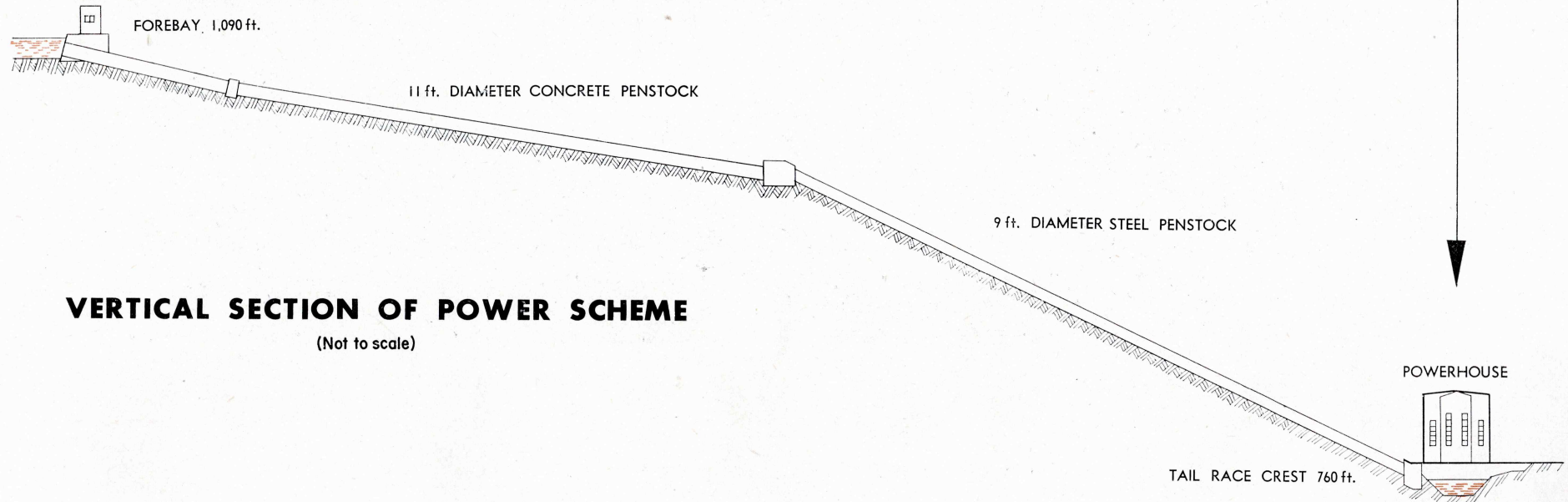
Water entering the Rangitata intake flows through the diversion race to the head race at the Rakaia end, the normal rate of flow being 1,000 cubic feet per second. From the forebay the water passes through the head gate and screens into the penstock and down to the turbine, with a gross head of 342 ft. The penstock, which is supported on roller bearings to allow for contraction and expansion, has an upper concrete section 810 ft. long and 11 ft. in diameter, while the lower 759 ft. is steel and is 9 ft. in diameter. From the turbine the water passes into the tail race to join the Rakaia River. In 1949 a weir was constructed in the tail race, and the bottom rebuilt in order to decrease the water velocity and consequent erosion, and a steel-faced concrete deflector block was recently placed to prevent damage by relief-valve discharge. A fish screen in the tail race prevents fish from entering the turbine draught tube into the machinery.

Power generated at 11,000 volts is stepped up to 66,000 volts by three single-phase transformers outside the powerhouse. From the outdoor station the power is transmitted to Hororata to link up with the main South Island network, and a short transmission line to Methven supplies the Ashburton Power Board. There is also another transformer bank outside the powerhouse which supplies power at 400 volts to the power station and village.

HIGHBANK DEVELOPMENT



MID-CANTERBURY IRRIGATION AREA



VERTICAL SECTION OF POWER SCHEME

(Not to scale)



Aerial View of diversion race and power station

Whites Aviation Ltd. Photo